DOCUMENT RESUME

ED 322 300 CE 055 278

AUTHOR	Vincent, Tom
TITLE	New Technology, Disability and Special Educational Needs. Working Together? A Series of Studies Carried Out for the UK Contribution to the OECD/CERI Disabled Action Programme.
INSTITUTION	Further Education Unit, London (England).
SPONS AGENCY	Organisation for Economic Cooperation and Development, Paris (France). Centre for Educational Research and Innovation.
REPORT NO	ISBN-1-85338-176-4
PUB DATE	89
NOTE	33p.; For related documents, see ED 308 406 and CE 055 279-280.
AVAILABLE FROM	Information Centre, Further Education Unit, 2 Orange Street, London WC2H 7WE, England (2.50 pounds; Working Together? pack: 12.50 pounds).
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Accessibility (for Disabled); *Access to Education; Agency Cooperation; *Disabilities; *Educational Technology; Equal Education; Foreign Countries; *Innovation; Linking Agents; Needs Assessment; Networks; Postsecondary Education; School Community Relationship; *Special Needs Students; Staff Development; *Technology Transfer; Theory Practice Relationship
IDENTIFIERS	*Great Britain

ABSTRACT

Developments within the area of new technology for disability and special educational needs have often been fragmented. The demands on innovators to exploit the new technology for specific and specialized applications have given them little opportunity to develop strategic plans in association with other innovators. Issues to be dealt with include the following: assessment, responsibilities and funding, compatibility of hardware and software, training, continuity, technical implications, customization or adaptation, technical support, management of resources, need for framework software that is not directed to specific curriculum objectives, developments in new technology, networking resources, access to information, and creating infrastructures. The state of the art summary contained in this publication draws on experiences of the new technologies from the further education sector and associated sectors: schools, employment, health, and social services. There are contributions from individuals and groups of students with special educational needs. These experiences lead to two general conclusions: (1) there is a need to enhance and expand networks of support within and between colleges in England and Wales, between educational levels, and between related aspects of employment, health, and social services; (2) it is vital to recognize that the new technologies cannot, in isolation, provide enablement, access, or opportunities unless effective support is in place, including the following: assessment and reassessment of individual needs; training for students and their teachers and their caretakers; information; advice; and technical services. (CML)

ED322300

Further Education Unit

Working Together?

A series of studies carried out for the UK contribution to the OECD/CERI Disabled Action Programme

New Technology, Disability and Special Educational Needs

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

FEU

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE055278

BEST COPY AVAILABLE

Further Education Unit

Working Together?

A series of studies carried out for the UK contribution to the OECD/CERI Disabled Action Programme

Further Education Unit

New Technology, Disability and Special Educational Needs

Dr Tom Vincent
Open University

Further Education Unit

FEU aims to promote, encourage and develop the efficient provision of further education in the United Kingdom by:

- reviewing and evaluating the range of existing curricula and programmes;
- determining priorities and recommending improvements;
- carrying out curriculum, studies, development and evaluation;
- disseminating FE curriculum information.

© Further Education Unit, 1989

ISBN 1 85338 176 4

Contents

	Page
Foreword	
1. Introduction	1
2. The OECD Disabled Action Programme	2
3. The Open University contributing project	3
4. The context of the project	5
5. Experiences	7
6. What are the issues?	13
7. The way forward	22
8. Further reading	25
9. Contacts	26

Foreword

In this study, Tom Vincent draws on the experience of over 100 contributors to explore the issues relating to the use of new technology by learners with special educational needs or disabilities. He gives the present 'state of the art' and then invites us to use the experience developed during the last ten years as a foundation for coherent long-term planning that will draw together key agencies and departments.

The study describes the work of centres of excellence that have developed but states that until networks of support at local and national level are enhanced and expanded, the experiences of many learners will remain fragmented and frustrating.

The use of new technology provides a way for many learners to share the same education, training and employment opportunities as their peers; it is truly enabling and empowering. The power it confers upon its users depends upon careful assessment of individual needs, both sustained and co-ordinated through all the phases of transition to active adult life.

Pat Hood,
Development Officer,
FEU

Dr Tom Vincent, MBE

Senior Lecturer in Education Technology in the Institute of Education Technology at the Open University.

Tom Vincent directs the 'Computing and the Blind' Project at the Open University. From 1986 to 1988 he was attached to HMI (DES) with a national remit for information technology for special education needs.

In 1984 he received the David Scott Blackhall award for his development of a microcomputer workstation for blind people, and in 1985 he received an MBE for his contribution to the application of information technology for people with disabilities.

Tom Vincent is the author of numerous articles on information technology for disability and special educational needs, and has co-authored two books: *New Information Technology in the Education of Disabled Children and Adults* and *Information Technology and Further Education*.

1. Introduction

During the past decade there has been a continual increase in the scale and scope of use of the new technologies for those students in further education with disabilities and special educational needs. It has been a period of innovation with numerous examples of how such technologies can provide students with more choice in relation to the curriculum, and provide new opportunities in transition to other educational areas and to employment. However, many students have not realised this potential or have not had such opportunities.

If the next decade is to see consolidation and further progress in the use of new technology for students with disabilities and special educational needs, it is crucial that the experiences from the past decade are drawn together and used as a basis for making recommendations about the way forward.

The compiling of the experiences within this publication is made possible by an Organisation for Economic Co-operation and Development (OECD) 'Disabled Action Programme' within which the Department of Education and Science (DES) has provided funding, through the Further Education Unit (FEU), for the support and co-ordination of several projects. The outcomes of a contributing project by the Open University form the basis of this publication.

This 'state of the art' summary draws on experiences from the further education sector and associated sectors: schools, employment, health, and social services. There are contributions from individuals and groups of students with special educational needs — the people for whom the schemes, initiatives and provision of the last decade have the greatest implications.

These experiences lead to two general conclusions:

- There is a need to enhance and expand networks of support within and between colleges, between educational phases, and between related aspects of employment, health and social services. This has implications for planning in colleges, local education authorities, and government agencies and departments.
- It is vital to recognise that the new technologies cannot, in isolation, provide enablement, access or opportunities unless effective support is in place, including:
  - assessment and re-assessment of individual needs;
  - training for students and their teachers and carers;
  - information;
  - advice;
  - technical services.

2. The OECD Disabled Action Programme

In 1988 it was felt that the time was right for the UK to become more active in the international field of disability and so the DES invited FEU to undertake the formation, co-ordination and management of the UK contribution to the new Centre for Educational Research and Innovation (CERI) Action Programme, 'Supporting Active Life for Young People with Disabilities'.

FEU, having consulted members of its Special Needs Advisory Committee and HMI, undertook to explore the feasibility of a project based on three elements of the CERI initiative:

- the application of the new technologies in support of the learning disabled;
- strategies for supported employment;
- planning transition to, and within, adult life.

A study was undertaken to examine ways in which existing work within these three target areas could be enhanced, and outcomes co-ordinated, by involvement in the CERI programme. The focus arising from the study would be on the value of inter-agency collaboration in the empowerment and sustained support of young people with disabilities as they make the transition into active adult life. A decision was taken that work would be considered only if it were likely that some part of the project would produce outcomes within a timescale that matched the other CERI activities.

The study had to be conducted within one month to enable the UK, if a project were feasible, to achieve its outcomes within the timescale already set for OECD work. It was, therefore, not exhaustive. It aimed to produce a state-of-the-art overview of work in the three selected areas and to identify issues which could be addressed through inter-agency collaboration.

An FEU Bulletin (*Transition to Adult Life for People with Disabilities*, May 1989) describes the feasibility study undertaken by the project (FEU project RP510), and outlines the issues identified.

3. The Open University contributing project

An Open University project ('New Technology, Disability and Special Educational Needs: "State of the Art" and "Case-Studies" in Further Education') forms the major component of the 'new technologies' element of the UK contribution to the CERI Action Programme. The project sought to identify local, regional and national initiatives concerning the introduction and application of new technologies for students with special educational needs in further education, and provided a means to:

- describe the experiences of several further education colleges;
- describe the experiences of individuals and groups of young people with special educational needs who have used new technology and who are involved in transitions between school and further education, further education and employment, and between special and mainstream provision;
- describe experiences in local education authorities;
- describe developments and experiences in related sectors:
  - employment
  - other phases of education
  - social services
  - Communication Aids Centres
  - projects and schemes;
- identify issues raised through the above experiences, in particular those concerning the individual needs of students. transition, inter-agency collaboration, and unmet needs;
- reinforce and develop further the network of people who are involved in the development and application of new technology for those with special educational needs, through their involvement in the project.

More than 100 people have been involved in the preparation of the articles in the full publication of the outcomes of the project. This includes 12 individual students, and a further 20 students who have participated in the collective writing of articles. There are contributions from further education lecturers and Local Education Authority staff. Together with related experiences from employment, other phases of education, social services, Communication Aids Centres, projects and schemes, this represents a significant cross-section.

At a Project Conference, 34 of the contributors joined together to consider the experiences presented in the full publication, and to

identify the key issues with particular reference to: *transition, inter-agency collaboration, and unmet needs in the context of the needs of individual students.* These issues form the basis of this summary.

4. The context of the project

a) New technology

Before about 1976, technology signified materials, tools, systems and techniques. With the development of the silicon chip in the early 1970s, there have been many new technological developments. Over the last decade, the major agent for these changes has been microelectronic devices which have been widely manifested as microcomputers.

The term 'new information technology' has acquired a special meaning. Information technology depends on the three complex techniques that have recently converged: computing, microelectronics and telecommunications. Hawkridge defines it thus: 'New Information Technology is new technology applied to the creation, storage, selection, transformation and distribution of information of many kinds'. The definition adopted by UNESCO is 'the scientific, technological and engineering disciplines and the management techniques used in information handling and processing; their applications; computers and their interaction with men and machines; and associated social, economic and cultural matters'. A simpler way, perhaps, is to survey the devices and systems that have emerged from the technology.

In practice, it has been the new technological advances associated with computers, microelectronic devices, and communication and mobility aids that have been significant for people with disabilities. Within the context of this publication, the term 'new technology' will be used to describe devices and systems associated with these advances.

b) Disability

An *OECD Educational Monograph* sought to clarify the terms 'handicap' and 'disability', and how the concepts may change as a person moves from childhood to adult and working life. The monograph outlines some of the criteria being used within various phases. The educational criteria include:

> 'Education services develop criteria to determine which pupils need some form of special educational help because of disabilities and difficulties. The nature and degree of an individual's handicap is not determined by the kind of sensory, physical or intellectual disability or behaviour difficulty which is manifest, but an individual's interaction with the environment, curriculum, methodology and ethos of regular schools.'

With respect to the assessment of handicap, the monograph indicates:

'More recently, particularly within the education sector, the main objectives of assessment have been to develop an individual programme or plan and identify and provide the special resources needed to implement it. This has involved a change from categorical thinking to thinking about individual needs and setting out to reduce the handicapping effects of an individual's disability.'

Within the context of this paper, the term 'disability' is used with respect to sensory, physical and intellectual disablement.

c) Special educational needs

The Warnock Report referred to the need for colleges of FE 'to consider both the modification of ordinary courses and the provision of special courses, either as links between school and college or as bridging courses to prepare young people with special needs for ordinary courses of work'.

The same report supported the principle, later endorsed through the 1981 Education Act, that those with special needs should, so far as is reasonably practicable, attend mainstream classes in normal educational settings. While the 1981 Act focused on schools, it allied with the Warnock Report in raising awareness of special needs in FE, and both gave impetus to the development of work for students with special educational needs in colleges.

HMI's *Education Observed* and an FEU *Special Needs Occasional Paper* suggest a more recent influential change. In the context of a growing concern to provide equal opportunities within FE, the concept of special educational needs is changing. *The focus of attention is shifting from provision for specific disabilities to a need for additional support assessed and provided on the basis of individual learning need.*

5. Experiences

If the next decade is to see consolidation and further progress in the use of new technology for students with disabilities and special educational needs, it is crucial that the experiences from the past decade are drawn together and used as a basis for making recommendations about the way forward.

The following sections draw on the experiences of students, lecturers, colleges, consortia of colleges, LEAs, related agencies and national schemes that are included in the full project report.

Students

There are several key features that emerge from the experiences of students. These include how new technology can:

- provide access to new opportunities in education and employment;
- give increased independence;
- assist with integration into mainstream activities;
- raise self esteem and self confidence;
- motivate. These features are highlighted by several students including:

Andrew Crowe who became totally paralysed from the shoulder downwards following an accident at the age of 15:

> 'Using the computer in the exams, I was able to pass three of the 'O' levels .... Without the computer, I feel the work at school would have been extremely boring as I would have lost all interest in the Subjects as I would have had to dictate each piece of work.

Another example of gaining independence comes from *Marisa Scott* who has athetoid cerebral palsy leading to speech and motor control difficulties. She was on a work preparation course at Trowbridge College. She writes:

> 'I needed a computer to communicate.... The computer means a lot to me because it has given me my independence and I can get on without asking people to do my paper work for me all the time, and I can write what I want in letters to friends.'

There are many instances where the 'equalising effect' of new technology is reported. For example, in a college situation, *Stewart Houston* comments on a personal computer that was provided by the COMET scheme:

> 'The computer took away the physical effort and strain of having to write out lengthy assignments. I could work faster with a

keyboard. My work had a neat and tidy finish to it.'In an employment environment, Beverley Ashton, who was one of the first employees to benefit from a DTI Remote Work Unit project comments: 'The most enjoyable facet of the job is my contact with the examiners and tutors of the SA Board list, all of whom are polite, co-operative and welcome voices on my phone. I don't know how many of them know I am disabled. It is satisfying that it makes no difference.'

Students with learning difficulties on a CPVE course at Brooklands College brought their views together on various aspects of using computers within the course. There are many comments that illustrate how the use of a word processor has assisted with written work including: 'It is easier on the screen to see my handwriting, so I can spot my mistakes more easily. It is also easier to get my spellings correct because I can see the words more clearly.' The raising of self-esteem, confidence and expectations is frequently refered to: 'It has given me much more confidence than when I started in first year at college. I think it will help me in the future when I start work, as I would like to work in a garage.'

However, the articles written by students also included many negative features in respect of using new technology. For example, a portable 'lap-top' computer played a significant part in *Craig Kirk's* progress from a course for people with disabilities in the Work Orientation Department at South Nottinghamshire College of FE to a mainstream BTEC course which he completed successfully. On transition to employment, there were difficulties: 'On leaving college, I initially had to return my computer. With my tutor's and parents' assistance I tried to find finance to buy my own but it proved difficult.' This proved to be a serious disruption to Craig's progress which was overcome by goodwill arrangements made by the College in the absence of any scheme to support an individual in transition. This is just one example of where phase-related provision causes problems which individual-related provision would not.

It is clear from these and many other experiences that although new technology has the potential to meet individual special needs, this potential cannot be achieved in isolation by the technology itself or without essential supporting elements: assessment, training, etc. The needs of students with disabilities and special educational needs are diverse and complex. These needs can be associated with physical and sensory disabilities, learning difficulties and, in many cases, multiple disabilities associated with varying degrees of learning difficulties. *It is important, therefore, to focus on the individual when a resource, such as new technology, is provided to meet those needs. Further, it is essential to take into account the 'whole needs' of a student rather than only those that can be met by the technology.*

Assessment of individual needs

For those with physical and sensory disabilities, provision has emerged. In 1986, the DES nominated three colleges (Doncaster, RNC Hereford and Hereward) to provide individual assessment in relation to an

Educational Support Grant for microelectronic devices. Subsequently, the Federation of Access Centres has extended assessment facilities to more students.

The limited resources available for assessment have resulted in the initial needs of some students being met. However, the needs of individuals are not usually static and the requirement for ongoing assessment is equally important. This is recognised but the resources are not available to provide this in many cases.

The experience described by Stewart Houston illustrates the need for ongoing assessment. He was provided with a computer (COMET awards scheme) which enabled him to produce written work with greater ease. However, as his skills increased and the need to produce more written work also increased as he progressed on his college course, the technology proved inadequate and led to frustration in respect of Stewart's higher expectations. His needs were reassessed by the COMET scheme and appropriate technology for his changed needs was provided.

Training

There are few new technology devices that do not require training in their functional use and, more importantly, how they can be used for individual needs and applications. Unfortunately, many training materials are limited to the functional aspect. Indeed, the materials often go little beyond reference manuals that are written by technologists for technologists.

The training needs of college staff vary depending on how and why new technology is being used with individual (or groups of) students. For example, a blind student using braille or synthesized speech might benefit considerably from lecturers adapting their style and format of teaching; but this does not happen intuitively, it requires appropriate training. Likewise, when computers are used with students who have learning difficulties, the training implications are significant.

Word processing

One of the striking effects of bringing together experiences from many independent sources, is the extent to which word processing has made a significant contribution to supporting many aspects of special educational needs. It is an interesting example of how a basic office facility has been exploited widely in ways which were never intended. The additional dimension to word processing that has proved invaluable in meeting individual needs is the Concept keyboard. Using this alternative input device to a computer, stories and other text can be produced by 'touching in' letters, words, phrases and pictures. In this way, the language needs of students can be met.

Colleges

The majority of initiatives in colleges have emerged within 'special

needs' departments rather than as part of a cross-college development. This is not surprising as funding to support initiatives has been directed towards special needs. *This can have unfortunate consequences as it often results in isolated provision rather than integrated provision with mainstream developments.*

One example is the choice of computer hardware, where the BBC microcomputer has been favoured for special educational needs, and the more commercially oriented IBM-compatible microcomputers for mainstream courses. This has implications for technical support, integration, staff development and transition. The choice of microcomputer is not a simple matter because account also has to be taken of the available software and enabling devices for special needs. To date, this latter aspect has been very limited with IBM compatible microcomputers.

At Bridgend College, the Access Centre was founded on the expertise and experience of staff from both information technology and special needs departments.

Staff at the College comment:

> 'The Access Centre provides a unique opportunity for co-operation between two sections of the College which results in appreciable and observable improvements in the quality of life of our students. In addition, it enhances the skill, expertise, understanding and tolerance of both the special needs and IT staff involved in its work.

Staff development and training

The need for staff development and training is echoed by staff in many of the contributing colleges. For example, at the South Warwickshire College of Further Education, the Co-ordinator for Special Needs writes:

> 'Because many teaching staff are not yet familiar with the computer technology, there is much need of staff development in order to fully exploit the potential of this technology with special needs students. In our experience team-teaching has proved most effective: a Computing teacher has become familiar with methods of teaching those with learning difficulties; and a Special Needs teacher has become more competent with the technology.'

At several colleges, there are report of students playing an active role in staff development which has resulted in positive benefits for both staff and students. For example, at Enfield College:

> 'The enthusiasm and persistence shown by one of our less able students to master the AMX graphics package resulted in his being able to make an active contribution to one of our staff development sessions. We often find that students can cope with some elements of the computer better and quicker than some of the staff, and this gives a considerable boost to student confidence levels.

Collaboration between colleges

There have been two major developments involving collaboration between colleges: the European Social Fund (ESF)/ Council for Educational Technology for the UK (CET) project for slow learners on Work Preparation courses (involving ten colleges); and the National Federation of Access Centres (involving 13 colleges/institutions).

The ESF/CET project demonstrated the value of a network of colleges in terms of staff development, sharing good practice and experiences, and being a resource for wider dissemination. The project had the benefit of a Co-ordinator. Unfortunately, the network did not retain its cohesion at the end of the supported project. Not least because *there was no national infrastructure in place in further education in which it could be sustained and developed further to bring colleges that were less well developed into the network.*

One of the ten colleges (Trowbridge) became a National Centre of Expertise but without the resources that could effectively develop and support any major network. However, the Centre (one person!) has been able to continue to make a significant contribution to staff development (as shown by comments made by individual colleges) and information provision through courses and resource materials. *The Centre cannot, however, serve the needs of all colleges without regional/ national infrastructures being in place.*

The National Federation of Access Centres (NFAC) emerged from the needs for colleges to seek advice, information and assessment for students with physical and sensory disabilities. This was assisted by individual colleges receiving Educational Support Grants and the DES recognising the need for centres that could provide assessment.

The Federation is now at a crucial stage in responding to the demands from other colleges to join the network. Although this is desirable, the lack of recognition of the NFAC by central government and the lack of resources to promote the networking aspect have not only inhibited expansion but places doubt over the prospects of the network being sustained. Its demise would be an unfortunate consequence as the funding required to maintain the network is far less than the resources that have been put in by individual colleges to create it. *This is another example of the constraining effect imposed by the absence of regional/national infrastructures.*

Other networks have emerged between colleges and involving other educational institutions:

- The consortium of Berkshire Colleges in response to the needs of deaf students;
- The Hampshire Information Technology Special Needs Interest Group which is open to all Hampshire colleges;
- The Somerset IT Group.

The experiences of these consortia are recorded in the full project publication.

National schemes

There is a perceived lack of collaboration between, and within, government departments in relation to schemes and initiatives in the area of new technology for disability and special educational needs. Colleges point to the apparent discrepancy between a national programme in the schools sector which has the support of an 'IT in Schools' Unit in the DES, a national centre (NCET/MESU — Microelectronics Education Support Unit), and a National Co-ordinator for information technology for special educational needs.

In the absence of an equivalent programme in further education, staff in colleges have expressed the view that the presence of a *national co-ordinating/advisory group* would facilitate networks both within further education and with other educational phases.

It is encouraging that the Department of Trade and Industry has made a significant input into promoting networks/collaboration between information providers, and also through the support for Home Delivered Training which has been a vehicle for inter-agency collaboration.

6. What are the issues?

Developments within the area of 'new technology for disability and special educational needs' have often been fragmented. This is not surprising with the wide range of technical innovations, the wide range of disability and special needs, and the possibility of applying the new technology within education, employment and in the home. The demands on innovators to exploit the new technology for specific and specialised applications has give them little opportunity to develop strategic plans in assocation with other innovators.

The question arises as to whether it is opportune and necessary to consider how the developments of the past decade might benefit within a less fragmented model. The question can only be answered if the broader implications of using new technology for disabled people are identified.

Figure 1 provides a summary of the issues that have been identified through the 'evidence base' that this publication provides. These issues have implications for students, staff, and for local and national provision. The Figure confirms that these numerous issues have to be considered in a total model as, in the final analysis, they all have an effect on how the individual special needs of students can be met most effectively.

There are general considerations which provide a context for these issues. Two fundamental considerations are 'what is the purpose of using new technology?' and 'what are the associated objectives?. These are crucial questions as the investment of time, effort and resources can be considerable. 'Timescale' is an important dimension as there are seldom 'instant' solutions. It may be months, or even years, after the introduction of new technology before objectives are achieved.

Finally, there is the need to 'evaluate' what has been achieved in order to provide feedback on individual progress, and to assess the effectiveness of strategy and methodology.

Within this context, the issues that have been identified are discussed below.

Assessment

What is the most appropriate new technology to meet the special needs and handicapping effects of disability? This question can only be answered satisfactorily if access is available to the wide range of expertise that might be necessary. This may be drawn from various disciplines including speech and occupational therapists, lecturers, computer scientists and electronic engineers, and involve carers and parents.

Figure 1 — Issues and their implications

	Assessment	Responsibilities and funding	Compatibility of hardware/ software	Individual or phase	Training	Continuity	Adapting	Technical support	Management of resources	Research	Networks	Access to information
Student	√				√							√
College staff	√				√				√		√	√
Local provision	√	√		√	√	√		√	√		√	√
National provision	√	√	√	√	√	√	√	√	√	√	√	√

Responsibilities and funding

If the outcome of assessment is the provision of new technology then there are immediate financial implications in relation to hardware, software, training, technical support and administration. Where does the responsibility lie for this? In practice, these financial resources have come from numerous charitable organisations, central and local government and, not least, individuals. Unfortunately, these resources have often concentrated on the provision of hardware and software at the expense of the supporting infrastructure.

Compatibility

One of the outcomes of the fragmented developments in the past has been the production of hardware and software that is incompatible with that from other sources. A project at the North East Wales Institute (ESF funded) sought to identify common standards without inhibiting imaginative and diverse innovations.

Individuals or phase

The provision of new technology may or may not be phase dependent. If it is, then provision from within a phase can be satisfactory. However, if the new technology enables or enhances communication or mobility, for example, then it is more likely that transfer across phase boundaries is necessary i.e. the provision is made in relation to an individual rather than the phase. In practice, this may not happen as many funding schemes are phase dependent.

In relation to the various aspects of provision, the general question of 'who is responsible?' arises. In practice, this is likely to depend on both local and national policies. In this respect, central government legislation can have a dominant effect. In the United States in 1986, Congress mandated that agencies formally assume responsibility for ensuring that office equipment, whether purchased or leased, be accessible to individuals with disabilities.

Beyond the provision of new technology, there are further general implications including training, support, continuity and development. These aspects complete the picture of the implications associated with the introduction of new technology.

There is a need to investigate whether the numerous, and often isolated, initiatives represented within this framework might be encouraged to form stronger links (inter-agency collaboration) in order fully to exploit existing new technology provision, and provide models for further developments.

Having identified these models, it is necessary to determine how local, regional and national policy and practice might be influenced to bring this about.

Training

Training is an essential component of the provision of new technology to meet the needs of disabled people. In addition to training in its functional use, there is also a need for training in the application of the technology to individual needs.

The under-exploitation of the new technologies for disabled people can often be associated with the absence of appropriate training. The reasons for this include the lack of financial resources (training can be more expensive than the technology provided), and, in many cases, the lack of awareness of the need for training.

In general, the documentation provided with new technology devices is a source of references to the functional features of the device. Although this type of documentation is necessary for technical support, it is often not suitable for a disabled person whose only interest is to use the technology for a specific need.

The training requirements for individuals have to be directly associated with assessment. Clearly, there is a need for a general training in the use of any new technological device; however, it is the training in relation to individual needs that will determine the overall effectiveness and efficiency.

In addition to training for individuals using new technology, there is also a need to train other people who are closely associated with these individuals. For example, a partially sighted student using closed-circuit television (CCTV) in the classroom will need to be trained in its use. However, there will also need to be complementary training for the teacher in how such a device can be integrated into classroom teaching. Seldom do such devices have no effect on the environment in which they are used.

The provision of good quality training material is an important requirement. However, the development of training materials requires a significant financial commitment. Although there will always be a need to develop specialised material, there is a need to consider the adaptation an ' modification of mainstream training resources for specific needs. In addition, the developments in open learning and distance teaching offer opportunities to provide alternative means of delivering the training.

Continuity

The provision of new technology needs to be considered in relation to the 'whole life' of a disabled person not just an individual phase.

At the beginning of the last decade, attention was focused on innovation with the increased availability of new technological devices (such as microprocessors and microcomputers). To a significant extent, research and development has been associated with individuals with specific needs in particular circumstances or groups of people in similar situations. There are many publications that describe these innovations. Often, they are associated with a single phase such as school or employment and, subsequently, schemes have emerged based on these phase related developments.

More recently, attention has focused on both how new technological developments can be shared across phases, and, of paramount importance, how these developments can facilitate the progress of disabled people across these phase boundaries (such as school or college to employment). This latter focus has been highlighted as the number of children and adults using new technology in one phase and then moving to another phase, continues to increase.

Continuity of provision is not limited to the supply of technological devices but extends to assessment, training and technical support.

Technical implications

New technology has many implications for disabled people. *A major consideration is how the many devices and systems that have emerged can be made accessible.* For example, output devices (screen or printer) are designed on the assumption that a visual medium is appropriate; this presents an immediate barrier for a blind person. Keyboards assume a manual dexterity which may not be possessed by a physically disabled person. Fortunately, there have been many developments to overcome these barriers that have resulted in new or adapted devices and systems.

Customisation or adaptation

There is a continuing debate as to whether customised devices should be developed for specific needs or whether it is preferable to concentrate effort on the modification of standard, commercially available hardware.

The advantage of customisation is that a device can be matched closely to an individual need. However, this is likely to result in devices that are more expensive because of the resulting limited markets.

Adaptation can be advantageous in cost terms but it can also have the advantage that disabled people are using standard equipment used by those without disabilities. This latter factor is particularly relevant to employment, and the creation of new employment opportunities.

One strategy has been to develop a customised interface through adapted software and hardware that meets the specific requirements of an individual person but still provides access to standard hardware and software. For example, the development of keyboard emulators that can accept single switch inputs and then transfer data to another system bypassing the conventional keyboard.

There is a need to ensure that enabling hardware and software conforms to basic standards in order to maximise the opportunity for access to standard, commercially available hardware.

Technical support

The introduction of new technology has not always been matched with appropriate technical support. In colleges, lecturers often undertake activities (maintaining hardware, configuring software, developing and

maintaining software libraries) that could be provided more effectively through technicians and technical centres. This not to say that lecturers and others have not done this satisfactorily, but that their time could be better served with developing curriculum applications and access to the curriculum through the technology.

The introduction of new technology in the home, in education or in employment requires the provision of technical support both for hardware repair and maintenance, and the organisation and maintenance of software.

Management of resources

One of the outcomes of the increasing availability of low-cost new technology is that an increasing percentage of disabled people have access to personal devices. It is not inconceivable in the near future (indeed, there are a few examples now) where every student in a college has personal use of, or access to, new technology for their individual needs. In terms of hardware and software, this results in a very large increase in resource levels in classrooms and schools. *It is becoming increasingly clear that lecturers are having difficulty in managing these resources, and that guidance on management is required.*

Management of resources can also be an issue where individuals are involved. For example, a blind person in an integrated environment (employment or mainstream education) may need to produce reports both in a visually readable format (print) and in a tactile medium (braille). Technology is available for this but the successful integration of technology into the working or educational environment will depend on how it can be managed effectively.

The increasing level of new technology being provided for individuals or groups of people requires more attention to be given to the management of resources for their effective use. Strategic models need to be developed for resource management.

In a situation where new technology is readily available, *there are temptations for the technology to be the dominant factor rather than the needs of a disabled person.* This is often apparent in the classroom, where the presence of a computer can dictate how and when it is used rather than its use being led by applications that have specific objectives.

Framework (content-free) software

Much of the early software for computers in education was directed towards specific, and often narrow, curriculum objectives. In many cases, this software had a specific content with very little flexibility to match it to individual needs. In special education this was often exacerbated by the language content of explanatory information and menus on computer screens which did not match individual language needs.

During the past few years, there has been an increased use of framework programs (word processors, databases, spreadsheets, art,

and music) which are free of content, where their application within the special needs curriculum can be matched more closely to the language and intellectual abilities of students.

The use of framework programs provides more opportunities for teachers to design and use curriculum support materials for the programs. These materials are generally much closer to other resource materials in the classroom which can often provide a bridge for teachers who cannot identify the link between new technology and teaching. The use of framework programs still requires appropriate training but it can be directed more towards curriculum applications.

Framework programs offer an opportunity for teachers to use a limited number of programs for a wide range of curriculum applications and special needs. There is a continuing need to produce high quality resource packs to support the training of teachers in these techniques and their application to special needs and learning difficulties.

New developments

Developments in new technology continue to emerge. These include artificial intelligence, expert systems, robotics, speech recognition, new generations of hardware and software, and high density storage devices for text, graphics, pictures, etc. In many cases, these new techniques offer even more potential to meet the needs of people with disabilities. However, unlike some of the earlier technologies, they are likely to require higher levels of skills and increased investment of time for them to be exploited fully.

Consideration needs to be given as to how existing research and development centres can develop the expertise to exploit these new developments, and how collaboration can be promoted between such centres to avoid unnecessary replication of effort.

The complexity and potential of the emerging new technologies are likely to be such that research and development centres will need more skilled staff, and engage in more collaborative investigations.

Networking resources

The nature of 'disability', 'special educational needs' and 'new technology' is such that they include many specialised areas of activity. When new technology is applied to these needs, these specialisations become even more intense. *For this reason, it is essential that collaboration and the sharing of resources is examined at every opportunity to ensure that the needs of everyone, regardless of how specialised, can be met.*

Access to information

For disabled people and their advisers, there will always be a need to gain access to information about the application and implications of new technology. Some progress has been made with the use of computerised databases and electronic communication networks. This

has often only been partially successful because of:

(i) the incomplete nature of many databases;

(ii) the general lack of familiarity and expertise in accessing on-line databases.

The Department of Trade and Industry (DTI) has been active for several years in promoting the use and networking of databases for people with disabilities. An 'Open Network' strategy has been supported by the DTI which seeks to provide a means whereby those who operate databases on subjects which are of interest to people with disabilities, can make their information accessible to a wider audience in a simple form, using structured requests and similarly structured replies. These standardised queries and responses are specifically adapted for delivery by means of an electronic network.

Access to information is not only a requirement for people with disabilities and their advisers, there is also a need for access to information for teachers, employers, researchers and developers, and other people associated with this area. The information needs are also broad and include not only information about hardware devices and software, but also applications, good practice, sources of advice, training and assessment, etc.

Access to information about the many aspects and implications of using new technology is crucial to both individual disabled people and other people associated with its application and development. The potential of new technology to disseminate this information is high but strategies have to be developed on how this can be achieved. Recent technological advances in compact disc technology offer new opportunities for disseminating information other then by electronic networks.

There appears to be a need for more publications that bring together examples of the application of new technology for disabilities (case-studies), sources of advice, training, assessment and resource materials.

Creating infrastructures

The presence of national and regional infrastructures can considerably enhance the opportunities for networking and sharing resources. In 1982 in England and Wales, a national network was envisaged with the establishment of four regional Special Education Microelectronic Resource Centres (SEMERCs). In practice, this has forged many links between schools and other agencies through the provision of information, publications, the identification of local co-ordinators, and the development of software and training resources that can be used nationally. However, the SEMERCs were constrained to work with schools and the links with further and higher education, and the employment sector, have been far less developed.

The development of infrastructures is very dependent, in turn, on the development of national and regional strategies. These aspects remain under-developed in further education.

Where infrastructures have emerged nationally and regionally, their

form and impact needs to be established in order that the production of strategic models can be considered and encouraged.

Objectives for using new technology

There are many reasons why an individual might use new technology. For any individual it must be clear what the objectives are.

The assessment, provision, training and support for the use of new technology represents a significant investment of time and resources. Not least, this is true for an individual who may have to invest a considerable amount of time and effort before seeing any return on that investment. In this context, the objectives for using new technology need to be clearly established for each individual.

The objectives may be very wide-ranging and include: communication, acquiring new skills, pleasure, access to the curriculum, and access to employment opportunities. These particular objectives are not discrete and, in the lifetime of an individual, may all be appropriate.

In education, in particular, there is a danger that new technology is used because it has been provided within an educational institution rather than for a specific need.

For individuals, the establishment of specific objectives within the overall objectives is important to ensure that the investment in time is maximised and, when there is transition to another phase, there is the possibility of providing detailed information on what has been achieved. This latter aspect has proved beneficial to students with disabilities and special educational needs, who have been able to demonstrate to employers their achievements in relation to specific objectives of using new technology.

7. The way forward

- There is evidence to show that the new technologies can enable students with disabilities and special educational needs to have a wider choice of courses and curricula, and to have new and enhanced educational and employment opportunities.

  This generalisation can be applied to all aspects of disability and special educational needs. *However, it is vital to recognise that the new technologies cannot, in isolation, provide enablement, access or opportunities unless effective support is in place, including:*
  - *assessment and re-assessment of individual needs;*
  - *training for students and their teachers and carers;*
  - *information;*
  - *advice;*
  - *technical services.*

- *It is essential that the needs of individual students are seen as being of prime importance within schemes, initiatives and developments that involve individuals receiving new technology to meet their needs.* The matching of new technology to individual needs should be evaluated; there is little evidence to suggest that this is being done.

- The complexities associated with the provision, assessment, training and application of the new technologies suggest the need for individual '*facilitators*' who can gain access to advice, experience and good practice that will provide students with choice and opportunities that, in turn, can provide increased independence.

- It is recognised that the new technologies can enable students to acquire skills (often in parallel with other curriculum activities) that match current and future requirements in employment. The opportunity to demonstrate these skills is evident in work experience and placements. It is also evident that many employers are unaware of the enabling potential of new technology which suggests that *raising awareness amongst employers is still a requirement.*

- Significant resources have emerged in the FE sector in response to 'grass root' demand for advice, information and support in relation to the use of new technologies for students with disabilities and special educational needs. This has often been achieved by goodwill and *ad hoc* measures and without any formal acknowledgement. This is a situation that has been sustainable in the short term but that is unlikely to be sustained in the long term, i.e. only a minority of students will benefit.

  In the absence of a national programme (equivalent to that in the schools sector, MEP/MESU), the investment of time and money exists in relative isolation in many colleges and, for this reason, has

often failed to realise the full potential of new technology for many students. *This is recognised in many colleges where there is a call for national/regional infrastructures and national co-ordination which can assist in both exploiting the new technologies, and providing a more effective and efficient use of resources.*

- The National Federation of Access Centres (NFAC) has emerged in response to the needs of colleges to gain access to expertise and experience. This has been achieved by significant inputs of time and resources by individuals and colleges. However, the Federation is not built on the strong foundation that national government recognition and support could provide. *It is seen as important that this network should not only be sustained but expanded to meet the ever increasing demands placed upon it.* In this way, students with disabilities will gain most benefit. It would be inefficient and ineffective if all colleges were to replicate the expertise that is available through the Federation for students with physical and sensory disabilities.

- The establishment of a National Centre of Expertise (Special Needs) at Trowbridge College by the DES (Education Support Grant) has made a valuable contribution to advice, information and staff development for numerous colleges in respect of students with learning difficulties. The Centre has one member of staff; this is an inadequate resource to meet the needs in the FE sector.

- There is a perceived lack of a reference point in the DES in relation to new technology for disability and special educational needs in further education. By contrast, in the schools sector, the DES IT in Schools Unit is seen as an important reference point for national and regional initiatives, and the focus for a national programme. The Unit has facilitated the integration of special needs into mainstream developments.

  There are alternative strategies that should be explored for further education. *It is suggested that an extension of the DES IT in Schools Unit remit to further education is one of the options that might be considered.*

- There is general agreement on the need for the principal national bodies involved (National Council for Educational Technology; SKILL: National Bureau for Students with Disabilities; Further Education Unit) to extend their collaboration. Each of these national bodies has made significant contributions to various aspects of new technology for disability and special educational needs. However, there appears to be an important *collective role* in supporting and promoting the networking of colleges; acting as an advisory group to central government; and, promoting inter-agency collaboration in relation to developments in other sectors: schools, adult and higher education; health; and, social services.

- *The training of academic staff, other professionals and carers must be continued with particular reference to how the new technologies can be used for individual student needs.* In this respect, the expertise and experience of students should be recognised. There is evidence to

suggest that students have made significant contributions to staff development.

There are numerous staff who have been engaged in staff training and development for several years who need to be provided with time and resources for their own training and development needs.

- There are likely to be new and emerging technologies that can benefit students with disabilities and special educational needs. *Continued research and development needs to be supported to exploit these technologies for individual needs.*
- After a decade of innovation and development, there is now a considerable body of experience and good practice in the FE sector. This knowledge has not permeated effectively to all colleges. *Dissemination of this knowledge is clearly desirable to ensure that unnecessary replication of effort is avoided.*

8. Further reading

Cox, J. *IT and Special Needs — Who's Who* Trowbridge College, Wiltshire, 1988

DES *Students with Special Needs in Further Education. Education Observed 9 (HMI)*, HMSO, 1989

FEU *Courseware Directory*, 1987 and 1988

Fowler, P. *IT Helps — Information Technology for FE Students with Special Needs* National Council for Educational Technology (NCET), 1988

Fowler, P., Cox, J. and Harvey, D. *Starting IT Up — An Awareness Pack* NCET, 1988

Fish, J. *Descriptions, Definitions and Directions: Special Needs Occasional Paper No.7* FEU, 1989

Hawkridge, D., Vincent, T. and Hales, G. *New Information Technology in the Education of Disabled Children and Adults* Croom Helm, 1985

Hope, M. *Micros for Children with Special Needs* Souvenir Press, 1987

Hope, M (ed.) *The Magic of the Micro: A Resource for Children with Learning Difficulties* Council for Educational Technology, 1986

NCET *Information Technology and Students with Learning Difficulties. NCET Information Sheet* October 1988

OECD Educational Monograph, No. 1, 1987

SKILL: National Bureau for Students with Disabilities *SKILL Directory of Research — Young People and Adults with Special Needs* 1988

Warnock, M. *et al. Report on the Committee of Enquiry into the Education of Handicapped Children and Young People*, HMSO, 1978

The full report of the activities of this project is available from Empathy Ltd., c/o Hereward College of FE, Braunston Crescent, Tile Hill Lane, Coventry, CV4 9SW. Tel. (0203) 461231

9. Contacts

Centre for Special Needs Technology, 18 Gravelly Hill North, Erdington, Birmingham B23 6QB

Federation of Access Centres, c/o Hereward College of FE, Bramston Crescent, Tile Hill Lane, Coventry CV4 9SW. (0203-461231)

Further Education Unit, 2 Orange Street, London WC2H 7WE. (01-321-0433)

Handicapped Persons Research Unit, Newcastle-upon-Tyne Polytechnic, Coach Lane Campus, Newcastle-upon-Tyne NE7 7TW. (0632-358211)

Microelectronics Education Support Unit (now NCET), Science Park, University of Warwick, Coventry CV4 7EZ. (0203-416994)

National Council for Educational Technology (NCET), 3 Devonshire Street, London W1N 2BA. (01-636-4186)

SKILL: National Bureau for Students with Disabilities, 336 Brixton Road, London SW9 7AA. (01-274-0565)

Trowbridge College (National Centre of Expertise), College Road, Trowbridge, Wiltshire BA14 0ES. (0225-767788)